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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/529,966	03/31/2005	James Guillet	1047-025	6278

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EXAMINER	
LIGHTFOOT, ELENA TSOY	

ART UNIT	PAPER NUMBER
1715	

NOTIFICATION DATE	DELIVERY MODE
11/23/2010	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/529,966	GUILLET ET AL.	
	Examiner	Art Unit	
	ELENA Tsoy LIGHTFOOT	1715	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 October 2010*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,15-17,67-71,74-76 and 82-88* is/are pending in the application.

4a) Of the above claim(s) *1,15-17,67,68,70 and 83-88* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *69,71,74-76 and 82* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Response to Amendment

Amendment filed on October 19, 2010 has been entered. Claims 1, 15-17, 67-71, 74-76 and 82-88 are pending in the application. Claims 1, 15-17, 67-68, 70, 83-88 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention and species.

Claims examined on the merits are 69, 71, 74-76, and 82.

Claim Objections

Claim 69 is objected to because of the following informalities: "compount" in line 4 should be changed to "compound". Appropriate correction is required.

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Rejection of claims 69, 71, 74-76, and 82 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention has been withdrawn due to amendment.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Rejection of claims 69, 71, 74-76, and 82 under 35 U.S.C. 103(a) as being unpatentable over Blum (US 6,180,562) in view of Feil et al (Macromolecules 1993, 26, 2496-2500) has been withdrawn due to amendment.

5. Rejection of claims 69, 71, 74-76, and 82 under 35 U.S.C. 103(a) as being unpatentable over Blum '562 in view of Savignano et al (US 5,653,054), and further in view of Feil has been withdrawn due to amendment.

6. Claims 69, 71, 74-76, and 82 are rejected under 35 U.S.C. 103(a) as being unpatentable over Blum (US 6,180,562) in view of Feil et al (Macromolecules 1993, 26, 2496-2500), further in view of Yoshioka et al (US 5,225,062).

Blum is applied here for the same reasons as set forth in paragraph 8 of the Office Action mailed on 4/30/2010:

Blum discloses that plants may be protected from damage caused by frost and/or freeze (See column 1, lines 10-12) by applying an aqueous composition comprising a crosslinked polymer (claimed internally substantially crosslinked polymer) (See column 10, lines 54-56) or a polymer having a relatively low amount of crosslinking (i.e. being internally crosslinked) (See column 10, lines 37-42) to the surfaces of the plants (See column 1, lines 6-10), which releases heat during freezing transition (See column 4, lines 21-25).

Blum teaches that heat is released over a temperature range because the polymers in the compositions exhibit a broad freezing transition range beginning at about 32^0F to about 27^0F or lower which enables the polymers to release their latent heat of fusion over a broad temperature range (See column 4, lines 21-30). It is also the Examiner's position that "32^0F to about 27^0F or lower" covers claimed "below 0^0C. It is well settled that overlapping ranges are prima facie

evidence of obviousness. It would have been obvious to one having ordinary skill in the art to have selected the portion of Blum's range that corresponds to the claimed range.

Blum fails to teach that the crosslinked polymer that is capable of releasing its latent heat over a range of dropping ambient temperature below 0^0C, is internally crosslinked polymer formed by polymerizing at least one non-ionic hydrophobic monomer comprising *acrylonitrile*, a cross-linker and non-ionic NIPAM (Claim 69).

Feil et al teaches that thermosensitive (internally) *crosslinked* polymers exhibiting LCST behavior have been investigated increasingly in recent years for applications such as solute separation (See page 2497, column 1, paragraph 1) for possibility of controlling temperature and heat of phase separation (See page 2497, column 1, paragraph 3). In general, the incorporation of hydrophobic co-monomers leads to a *lower LCST* and hydrophilic monomers to a higher LCST, e.g. copolymerizing NIPAM with acrylamide (hydrophilic) leads to a higher LCST and lower *endothermic* heat of phase of separation (See page 2497, column 1, paragraph 2). Although Feil et al studied the role of co-monomer on LCST phenomenon on a crosslinked polymer formed by polymerizing (non-ionic) N-isopropylacrylamide (NIPAAm), butyl methacrylate (BMA, non-ionic hydrophobic monomer), and X (claimed cross-linker), with X being hydrophilic, hydrophobic, cationic, or anionic co-monomers. (See page 2496, column 1, paragraph 3), Feil et al came to the conclusion that temperature induced phase separations of solutions of LCST polymers are mainly driven by increased interactions between hydrophobic moieties on the polymers, caused by a reduced structuring of water around hydrophobic polymer side groups (decreased stabilization of hydrophobic groups in water) with increasing temperature. Changes on LCST caused by the incorporation of co-monomers are due to changes in overall

hydrophilicity of the polymer. (See page 2500, column 1, Conclusions). Thus, Feil et al does not limit hydrophobic monomer to BMA.

Note that phase separation of an aqueous system comprising a polymer exhibiting LCST behavior that occurs on raising a temperature above LCST is an *endothermic* process. Therefore, a reverse process which occurs upon lowering temperature below LCST is *exothermic*, i.e. it releases *heat*. Thus, a thermosensitive (internally) *crosslinked* NIPAM-*co*-non-ionic hydrophobic monomer-*co*-crossinker polymer of Feil et al that exhibit LCST behavior is capable of releasing *heat* upon lowering temperature below the desired LCST.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used a crosslinked polymer formed by polymerizing (non-ionic) N-isopropylacrylamide, (non-ionic hydrophobic monomer) and a crossinker, as a crosslinked polymer of Blum which releases heat during freezing transition with the expectation of providing the desired protection of plants from frost damage since Feil et al teaches that a crosslinked NIPAM-co-non-ionic hydrophobic monomer-co-crossinker polymer exhibits LCST behavior and is capable of releasing heat upon lowering temperature below the desired LCST, and since Blum does not limit its teaching to particular heat releasing polymers.

Feil et al fails to teach that a non-ionic hydrophobic monomer comprising *acrylonitrile* may be used as non-ionic hydrophobic monomer for making thermosensitive (internally) *crosslinked* polymer formed by polymerizing (non-ionic) N-isopropylacrylamide, (non-ionic hydrophobic monomer) and a crossinker polymers.

Yoshioka et al teaches that a temperature-responsive polymer showing, in the presence of water, hydrophobicity at a temperature higher than the LCST and showing hydrophilicity at a

temperature below the LCST (See column 3, lines 11-16) may be made by copolymerizing NIPAM (See column 3, line 58) with any hydrophilic monomers and hydrophobic monomers (See column 3, line 66 to column 4, line 2) and a bifunctional monomer (claimed crosslinker) (See column 4, lines 27-33). Generally speaking, copolymerization with a hydrophilic monomer will raise the LCST, and copolymerization with a hydrophobic monomer will lower the LCST. With an appropriate selection of the monomers, a copolymer having a **desired LCST** can be obtained. (See column 4, lines 2-7). Examples of suitable hydrophobic monomers are not limited and include ethyl acrylate, methyl methacrylate and **acrylonitrile** (See column 4, lines 19-26).

In other words, Yoshioka et al teaches that alkyl methacrylate or acrylonitrile may be used as a hydrophobic monomer for making a thermosensitive (internally) crosslinked NIPAM-*co*-non-ionic hydrophobic monomer-*co*-crossinker polymer exhibiting LCST behavior.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used acrylonitrile as a hydrophobic monomer for making crosslinked NIPAM-*co*-non-ionic hydrophobic monomer-*co*-crossinker polymer in Blum in view of Feil et al with the expectation of providing the desired polymer exhibiting LCST behavior since Yoshioka et al teaches that alkyl methacrylate or acrylonitrile may be used as a hydrophobic monomer for making a thermosensitive (internally) crosslinked NIPAM-*co*-non-ionic hydrophobic monomer-*co*-crossinker polymer exhibiting LCST behavior, and since Feil et al does not limit its teaching to particular hydrophobic monomers.

As to claims 74-76 and 82, Blum teaches that a molecular weight of heat releasing polymer could be in the range of 1,000,000-2,000,000 (See column 11, lines 52-53), i.e. within claimed range of 500,000-50,000,000.

It is the Examiner's position that the crosslinked polymer of the cited prior art having M.W. within claimed range have diameter within claimed range of 1-1000 nm, as required by claims 74, 76, 82.

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

US 5900405 to Urry is cited here to show that the phenomena of inverse temperature transitions in aqueous systems occurring in a number of amphiphilic polymer systems that have an appropriate balance and arrangement of apolar and polar moieties was known in the art. The polar species contribute to the solubility in water at low temperature, a solubility that results in waters of hydrophobic hydration for the apolar moieties. The waters of hydrophobic hydration, often referred to as clathrate or clathrate-like water, have specific thermodynamic properties: an exothermic heat of hydration (a negative ΔH) and a negative entropy of hydration (6,7). On raising the temperature, by means of an *endothermic* transition (8), the low entropy waters of hydrophobic hydration become bulk water with a significant increase in solvent entropy as the polymers fold and aggregate, optimizing intra- and intermolecular contacts between hydrophobic (apolar) moieties with a somewhat lesser decrease in polymer entropy than increase in solvent entropy. Such polymers, when their transitions occur between 0° and 100 °C, can be used to control events in the aqueous environments that occur in biology. (See column 16, lines 40-59).

Response to Arguments

Applicant's arguments with respect to claims 69, 71, 74-76, and 82 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ELENA Tsoy LIGHTFOOT whose telephone number is (571)272-1429. The examiner can normally be reached on Monday-Friday, 9:00AM - 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on 571-272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Elena Tsoy Lightfoot, Ph.D.
Primary Examiner
Art Unit 1715

November 18, 2010

/Elena Tsoy Lightfoot/